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FLOOD INSURANCE STUDY

COMPLETED
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TOWN OF HOLYOKE, COLORADO
PHILLIPS COUNTY

ORIGINAL

FEBRUARY 19, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 080141

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for flood plain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Holyoke, Phillips County, Colorado, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Town of Holyoke to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by other organization(s) originally for purposes other than the National Flood Insurance Program (NFIP). The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the NFIP. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the address below for consideration for revision of this study:

> Natural and Technological Hazards Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers (COE), Kansas City District, as reported in Flood Plain Information, Frenchman Creek, Holyoke, Colorado (Reference 1). This report was completed in June 1980.

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1.3 Coordination

The following agencies, firms, and organizations assisted in the preparation of the COE report used to generate this study: U.S. National Oceanic and Atmospheric Administration, Weather Service; U.S. Geological Survey (USGS); Colorado Water Conservation Board; Colorado State Highway Department; the Town of Holyoke; U.S. Soil Conservation Service; Holyoke Enterprise; Phillips County Land Use Planning Office; and Harmon Engineering Services.

The final community coordination meeting was held on December 17, 1985, and attended by representatives of FEMA and the community. All problems raised at that meeting have been resolved in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the Town of Holyoke, Phillips County, Colorado. The area of study is shown on the Vicinity Map (Figure 1).

This detailed study presents the results of a report on Frenchman Creek in the vicinity of Holyoke. Frenchman, North Fork Frenchman, and South Fork Frenchman Creeks were studied by detailed methods. The lower limit of study on Frenchman Creek extends approximately 2 miles east, and the upper limit of study on North Fork and South Fork Frenchman Creeks extends approximately 1 mile west of the town limits. Approximately 2.3 miles of detailed study fall within the town limits.

The areas studied by detailed methods were selected based on the extent and validity of available hydrologic and hydraulic data.

2.2 Community Description

The Town of Holyoke is located along Frenchman Creek, in central Phillips County, in the northeastern corner of Colorado. Phillips County is bordered by Sedgwick County to the north, Yuma County to the south, Chase and Perkins Counties to the east, and Logan County to the west. According to the U.S. Census Bureau figures, the population of Holyoke was 2,092 in 1980 (Reference 2).

The flood plain of Frenchman Creek within the study reach is rather flat, which has encouraged development. Most of the urbanized development within Holyoke borders the south bank of the creek. With this urbanization, the flood hazard to the community will continue to increase unless adequate flood plain regulations are adopted.

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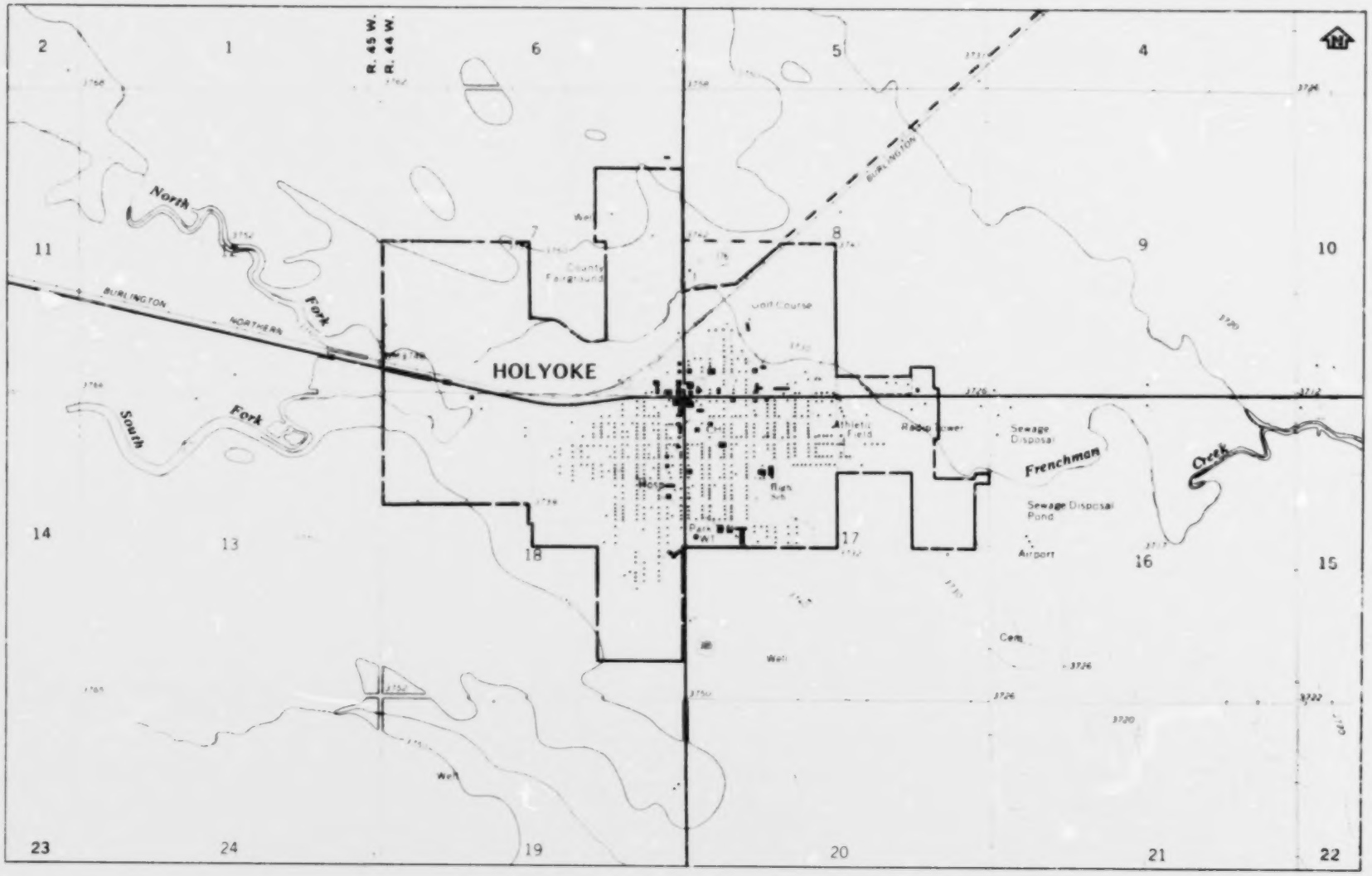

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF HOLYOKE, CO
(PHILLIPS CO.)

APPROXIMATE SCALE

2500 0 2500 5000 7500 FEET

VICINITY MAP

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The Frenchman Creek drainage basin is located in the northeastern corner of Colorado in Logan, Sedgwick, and Phillips Counties. Its headwaters are within Logan County about 20 miles west of Holyoke. The creek flows in an easterly direction, emptying into the Republican River near Culbertson, Nebraska.

The basin divides into two subbasins at the west edge of Holyoke. North Fork Frenchman Creek has a drainage area of 164 square miles. South Fork Frenchman Creek drains an area of 63 square miles. The combined contributing drainage area for Frenchman Creek is 227 square miles at U.S. Highway 385.

The topography of Frenchman Creek basin consists of low hills dividing the waterways. The larger waterways have well-defined channels, whereas the smaller ones lie in swales between drainage divides. The basin is elongated, with its major drainage flow patterns in a west to east direction. Ground elevations vary from a maximum of 4,500 feet above National Geodetic Vertical Datum (NGVD) in the headwaters to 3,700 feet NGVD at Holyoke.

The climate of northeast Colorado is semiarid, with hot, dry summers and cold winters. Air currents from the Gulf of Mexico are the primary source of moisture. Localized and short-duration thunderstorms account for much of the total annual precipitation.

2.3 Principal Flood Problems

Floodflows in this area of Colorado generally result from high-intensity, short-duration, cloudburst-type thunderstorms. Frenchman Creek has experienced few of these thunderstorm, whereas adjacent basins have experienced extremely intense thunderstorms. Most of these thunderstorms occur from late spring to late summer. Because of these highly localized storms, runoff is characterized by a quick buildup to a peak and then a tapering off.

Obstructions to floodflows within the study reach include natural obstructions, such as brush and other vegetation growing along the streambanks, and nonnatural obstructions, such as bridges, road embankments, buildings, and culverts. During floods, these obstructions impede floodflows and cause backwater conditions that may increase the flood heights upstream and increase velocities downstream.

Three bridge obstructions exist in the flood plain of Holyoke. The first two are for Interocean Avenue (U.S. Highway 385) and Burlington Northern. The third is for Denver Street (U.S. Highway 6) at the east edge of Holyoke. During high floodflows, these bridges can cause a backwater effect upstream of the structure. The Denver Street bridge will cause a divided flow area along the north side of the roadway because of the backwater effects of the structure. Brush and other debris washed downstream may also collect at these bridges, thus creating a more serious damming

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effect and overbank flows. As floodflows increase, masses of debris may break loose from one bridge and cause a wall of water and debris to surge downstream to another obstruction. In some instances, debris may collect and cause structural damage.

The Town of Holyoke has little history of flooding. Information on historical floods that have occurred in the study area is limited to that on historical rainfalls and in newspaper files. Stream-gaging stations (Reference 3) within the Frenchman Creek basin (Table 1) show a limited flood history.

The following information on historical rainfall was taken from newspaper accounts in the Holyoke Enterprise on July 26, 1963 (Reference 4):

> Five-inch rain at Amherst; 3.21 inches on government gage at Holyoke (mostly within 1 hour); 3.5 inches at other places in Holyoke; 2.5 inches at Sterling flooded basements and some general stores; 2.5 inches east of Holyoke; 2 inches 4 miles south of Holyoke. One of the heaviest rainfalls ever experienced in Holyoke over such a short period of time (less than 1 hour). Mentioned damage to one home in Amherst but nothing at Holyoke.

2.4 Flood Protection Measures

No flood-control structures exist in the Town of Holyoke.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

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Table 1. Frenchman Creek Stream-Gaging Stations

USGS Gage No.	Location	Drainage Area (Square Miles)	Years of Record	Historic Peak Discharge Cubic Feet per Second (cfs)
8315	Frenchman Creek At Imperial, Nebraska	720	38	2,340
8340	Frenchman Creek At Palisade, Nebraska	950	28	5,500
8355	Frenchman Creek At Culbertson, Nebraska	1,470	48	15,000

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Flood freqency curves for the 10-, 50-, 100-, and 500-year recurrence intervals were prepared for Holyoke at U.S. Highway 385. Several methods were investigated to obtain the best possible comparison for frequency-curve selection (References 5, 6, 7, and 8). A detailed description of the hydrologic analysis used to prepare this study, is available in the Technical Addendum to the Flood Plain Information report for Frenchman Creek (Reference 9).

Peak discharge-drainage area relationships for Frenchman Creek, North Fork Frenchman Creek, and South Fork Frenchman Creek are shown in Table 2.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

The water-surface elevations were computed using the COE HEC-2 step-backwater computer program (Reference 10). Cross sections for the backwater analysis were developed using topographic maps at a scale of 1:2,400, contour interval 2 feet (Reference 11).

Roughness factors (Manning's "n") for use in hydraulic computations were assigned on the basis of field inspection of flood plain areas. Frenchman Creek, North Fork Frenchman Creek, and South Fork Frenchman Creek roughness factors are 0.04 for the channels and 0.05 for the overbank areas. A detailed description of the hydraulic analysis is included in Reference 9.

All elevations are referenced to the NGVD. Elevation reference marks used in this study are shown on the maps; the description of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year flood plain boundaries and 100-year floodway to assist communities in developing flood plain management measures.

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Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Frenchman Creek					
At U.S. Highway 385	227	2,750	6,200	8,200	14,900
North Fork Frenchman Creek					
At Mouth	164	2,240	5,200	6,970	12,640
South Fork Frenchman Creek					
At Mouth	63	1,170	2,800	3,740	6,870

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2,400, with a contour interval of 2 feet (Reference 11).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE); and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

Approximate 100-year flood plain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map (Reference 12).

4.2 Floodways

The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

No floodways have been computed for Frenchman, North Frenchman, or South Frenchman Creeks.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown in this zone.

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Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For flood plain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year flood plains.

7.0 OTHER STUDIES

A Flood Plain Information report on Frenchman Creek by the COE (Reference 1) was used to prepare this Flood Insurance Study. The Technical Addendum to the COE report includes supporting engineering and hydrologic data (Reference 9). This Flood Insurance Study supersedes the Flood Hazard Boundary Map prepared for the Town of Holyoke (Reference 12).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

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9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of the Army, Corps of Engineers, Kansas City District, Flood Plain Information, Frenchman Creek, Holyoke, Colorado, June 1980

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Colorado, 1981

3. U.S. Department of the Interior, Geological Survey, Water-Data Report, Water Resources Data for Nebraska

4. Holyoke Enterprise, Holyoke, Colorado, July 26, 1963

5. U.S. Department of the Interior, Geological Survey, Manual for Estimating Flood Characteristics of Natural-Flow Streams in Colorado

6. U.S. Department of the Interior, Geological Survey, Manual for Estimating Magnitude and Frequency of Floods in Kansas

7. U.S. Department of the Interior, Geological Survey, Manual for Estimating Magnitude and Frequency of Floods in Nebraska

8. U.S. Environmental Protection Agency, "Storm Water Management Model," March 1975

9. U.S. Department of the Army, Corps of Engineers, Kansas City District, Technical Addendum Hydrology Study for Frenchman Creek, Holyoke, Colorado Flood Plain Information, April 1978

10. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Program 723-X6-6202A, HEC-2 Water-Surface Profiles, Davis, California, 1976

11. U.S. Department of the Army, Corps of Engineers, Kansas City District, Topographic Maps, Scale 1:2,400, Contour Interval 2 feet: Colorado (1976)

12. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Holyoke, Colorado, Scale 1:800, revised January 1976

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Exhibit 3 - Elevation Reference Marks

REFERENCE MARK	FIRM PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM1	0001	3736.279	A standard disk stamped "A 15 1926," located at the southeast corner of the intersection of Interocean Avenue and Emerson Street, at the northwest corner of the courthouse yard, 16.4 feet south of the outside edge of east-west sidewalk, 2.4 feet east of the inside edge of north-south sidewalk.

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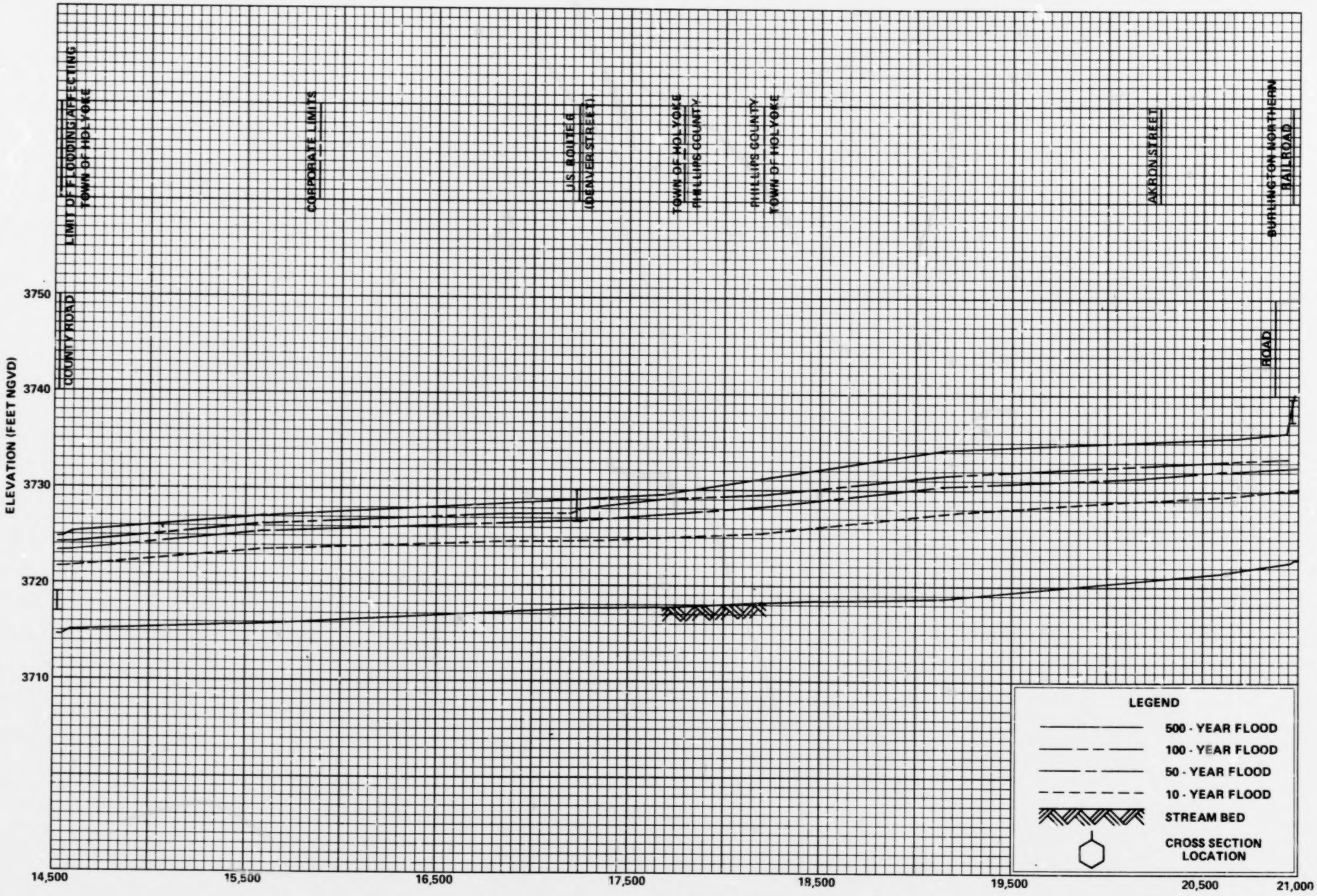

FLOOD PROFILES

FRENCHMAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF HOLYOKE, CO
(PHILLIPS CO.)

01P

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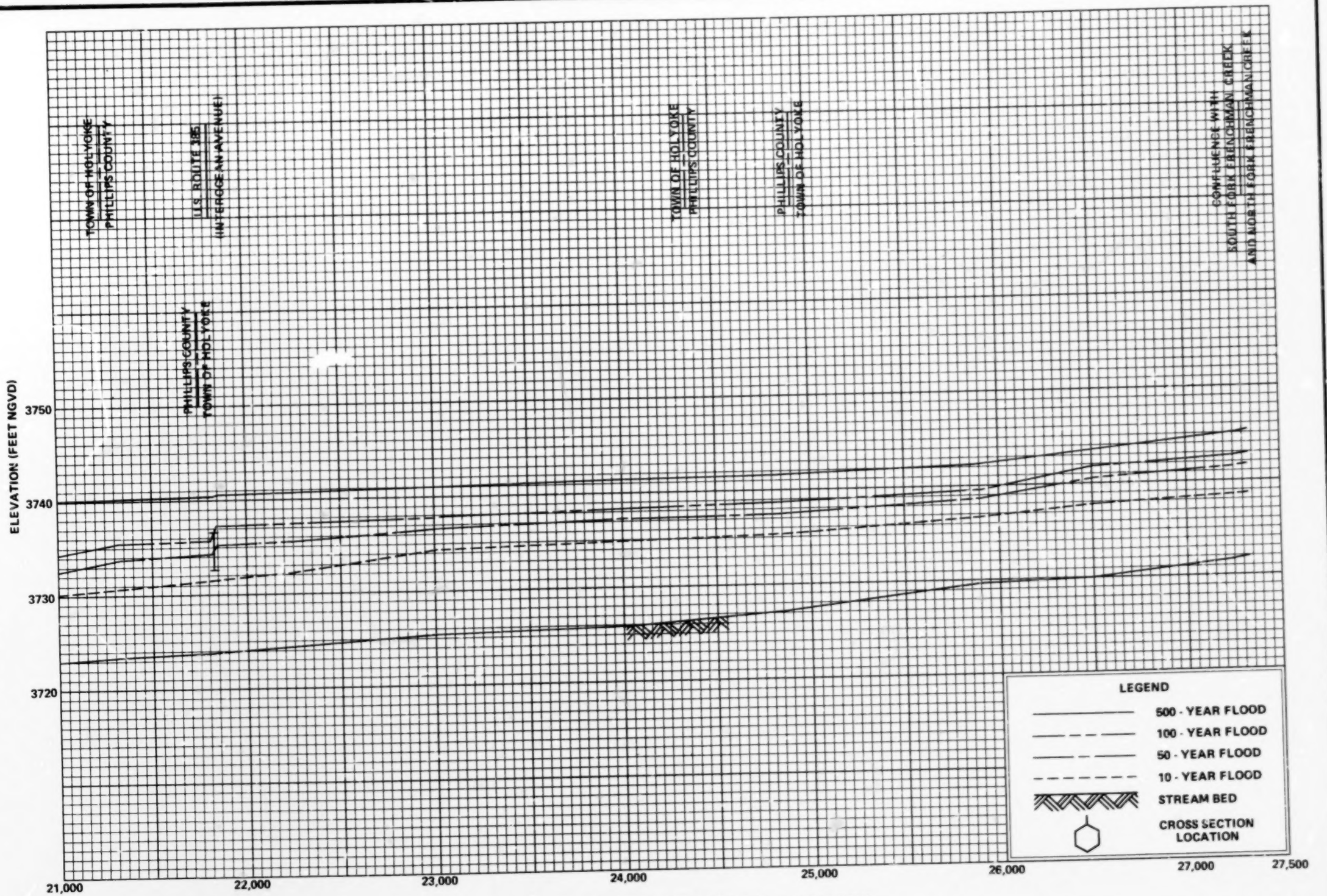

FLOOD PROFILES

FRENCHMAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF HOLYOKE, CO
(PHILLIPS CO.)

02P

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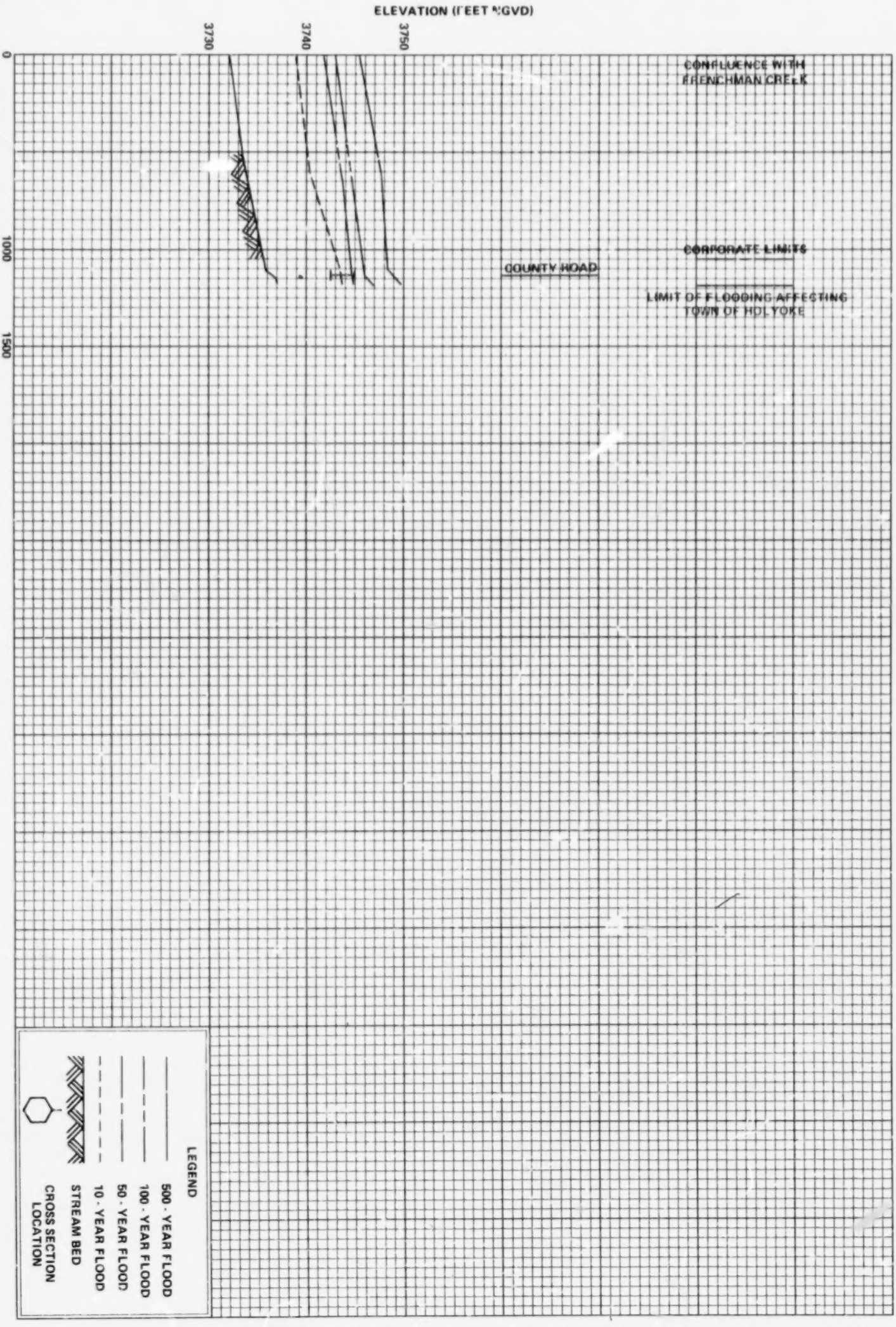

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF HOLYOKE, CO
(PHILLIPS CO.)

FLOOD PROFILES

NORTH FORK FRENCHMAN CREEK

03P

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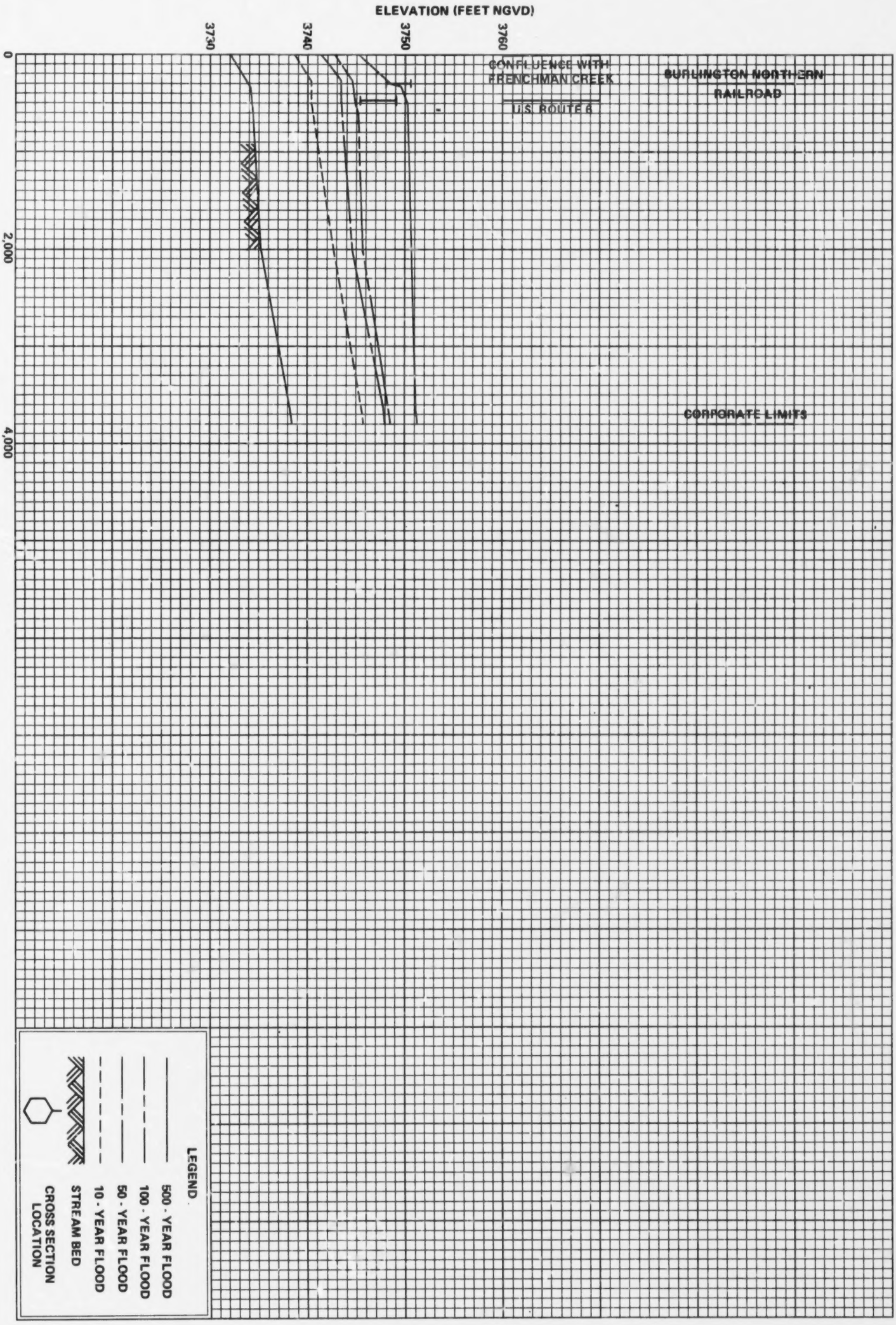

04P	FEDERAL EMERGENCY MANAGEMENT AGENCY TOWN OF HOLYOKE, CO (PHILLIPS CO.)	FLOOD PROFILES SOUTH FORK FRENCHMAN CREEK

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